

REMARKS

Claims 1 and 11 have been amended. Claims 9, 15, 16, 21, 30 and 31 have been cancelled. No new matter has been added.

Information Disclosure Statement

The reference designated "A21" in the Form PTO-1449 filed on February 9, 2001 was a draft of a publication that was subsequently published on the internet on September 14, 2000 as "Layered, Erasable, Ultrathin Polymer Films" *J. Am. Chem. Soc.* **2000**, 122, 9550-9551. A copy of the published paper is submitted as part of a Supplemental Information Disclosure Statement, which is filed together with this Amendment And Request For Reconsideration.

Rejections under 35 U.S.C. § 102

The present invention includes a polymer film comprising at least two layers held together by hydrogen bonding between the layers. The polymer film does not include any layers held together by permanently electrostatically charged groups when the film is stable. Rather, one of the layers contains hydrogen bond donating moieties while the other layer contains hydrogen bond accepting moieties. Thus, the layers of the film may be held together through hydrogen bonding rather than through electrostatic interactions. The term "permanently electrostatically charged groups" refers to groups that exist as fully dissociated salts (e.g. strong electrolytes such as SO^-Na^+). A polymer with permanently electrostatically charged groups differs from a polymer containing charge forming groups, which may be slightly ionized but does not contain sufficient amounts of electrostatically charged groups to cause dissolution or decomposition of the film (see, for example, p. 7, lines 18-20 and p. 9, lines 10-13).

Moreover, the two layers each contain a different polymer, and these polymers are soluble in water. Thus, the layered film may be prepared by applying a solution of one of the polymers in water, followed by applying a solution of the other polymer in water. Multiple layers can be formed by repeating these solution applications. These

layered films may be destroyed in water by changing environmental conditions such as pH, ionic strength, applied electric field, and particular dissolved ions.

Rejection over Benjamin et al.

Claims 1-31 were rejected under 35 U.S.C. § 102(b) over Benjamin et al. (*Journal of Materials Chemistry*, 8(4) 1998, 919-924). The Office Action asserts that Benjamin et al. discloses a multilayer film containing polyethyleneimine, poly(styrenesulfonic acid sodium salt), and a poly(phenylene vinylene) derivative, where the layers are held together with hydrogen bonding interactions. The Office Action correlates polyethyleneimine with a polymer comprising hydrogen bond donating moieties and correlates the poly(phenylene vinylene) derivatives with a polymer comprising hydrogen bond accepting moieties.

The rejection of the claims under 35 U.S.C. § 102(b) over Benjamin et al. has been obviated by appropriate amendment. As amended, independent claims 1 and 11 now recite that:

... the film does not contain a polymer layer comprising a plurality of permanently electrostatically charged groups when the film is stable.

Thus, independent claims 1 and 11 specifically exclude films having a layer of a polymer containing electrostatically charged groups when the film is stable. As noted in the specification:

The environmental conditions under which the film is formed are selected so that there is insufficient charge on the charge-forming groups to prevent film formation, or insufficient charge to cause dissolution of the film.

[p.7, lines 18-20]

Examples of the stability of hydrogen-bonded films that do not contain a polymer layer comprising electrostatically charged groups are provided throughout the specification. See, for example page 5, line 4 through page 6, line 5; and page 10, line 24 through page 11, line 19.

In contrast, the tri-layer films as disclosed by Benjamin et al. include a middle layer of poly(styrenesulfonic acid sodium salt), which is said to interact with conjugated polymers through electrostatic interactions [p. 922, lines 7-14 and 18-20]. Benjamin et al. does not teach or suggest the formation of layered polymer films that are held together through hydrogen bonding, without a layer of a polymer containing electrostatically charged groups.

Moreover, independent claims 1 and 11 now recite that “the first and second polymers are each soluble in water.” The use of water soluble polymers comprising hydrogen bond donating moieties and water soluble polymers comprising hydrogen bond accepting moieties is described in the specification, at least at page 9, line 4 and in the Examples (p. 9, line 20 – p. 11, line 19). In contrast, the final films as disclosed by Benjamin et al. include a layer of a conjugated poly(phenylene vinylene) derivative, which is not soluble in water. The layers of this polymer are disclosed as being formed from a water soluble precursor polymer, which is then thermally converted into the final conjugated polymer [p. 924, left column, lines 11-47]. Thus, Benjamin et al. does not teach or suggest the formation of layered polymer films held together through hydrogen bonding, where the polymers present in the film are water soluble.

Benjamin et al. cannot anticipate independent claims 1 and 11 since it does not teach or suggest each and every element of the claims. Claims 2-8, 10, 17-19 and 22-27, which depend on claim 1, and claims 12-14, 28 and 29, which depend on claim 11, are thus also not anticipated. Accordingly, pending claims 1-8, 10-14, 17-20 and 22-29 are not anticipated by Benjamin et al., and Applicants respectfully request that this rejection be withdrawn.

Rejection over Opolski

Claims 1-31 were rejected under 35 U.S.C. § 102(e) over Opolski (U.S. Patent No. 6,238,799 B1). The Office Action asserts that Opolski discloses a coating composition containing two polymers held together “at least in part by hydrogen bonds.” The Office Action points to Example 2 in Opolski and correlates the acid functionalized polyacrylate with a polymer comprising hydrogen bond donating moieties and the poly(vinylpyrrolidone) with a polymer comprising hydrogen bond accepting moieties.

The rejection of the claims under 35 U.S.C. § 102(e) over Opolski has been obviated by appropriate amendment. As amended, independent claim 1 now recites that the film comprises:

... a first layer, comprising a first polymer comprising a plurality of hydrogen bond donating moieties, and
a second layer, comprising a second polymer comprising a plurality of hydrogen bond accepting moieties; ...
[Claim 1, emphasis added].

As amended, claim 11 now recites that the film comprises:

a first layer, comprising a first polymer, and
a second layer, comprising a second polymer,
wherein the second polymer is hydrogen bonded to the first polymer ...
[Claim 11, emphasis added]

Thus, independent claims 1 and 11 recite a film comprising two different polymers in distinct layers where the two polymer layers are held together by hydrogen bonding.

In contrast, Opolski discloses single layer coatings made from a liquid coating composition containing a mixture of a hydrophilic polymer and a crosslinkable supporting polymer. These polymers are described in Opolski as forming “an association complex in the aqueous-based medium” [col. 4, line 65 through col. 5, line 3]. According to the reference, the coating composition containing both polymers is applied to a surface, and the supporting polymer is then crosslinked to “immobilize the hydrophilic polymer within the crosslinked network” [col. 6, lines 13-16]. This procedure of coating with a single coating composition is further described in col. 7, line 48 through col. 8, line 25 and in Examples 1-6. Opolski does not teach or suggest a film containing two polymers in distinct layers, where the layers are held together by hydrogen bonding. Opolski cannot anticipate independent claims 1 and 11 since it does not teach or suggest each and every element of the claims. Claims 2-8, 10, 17-19 and 22-27, which depend on claim 1, and claims 12-14, 28 and 29, which depend on claim 11, are thus also not


anticipated. Accordingly, pending claims 1-8, 10-14, 17-20 and 22-29 are not anticipated by Opolski, and Applicants respectfully request that this rejection be withdrawn.

Conclusion

In conclusion, all of the grounds raised in the present Office Action for rejecting the application are believed to be overcome or rendered moot based on the remarks above. Thus, it is respectfully submitted that all of the presently presented claims are in form for allowance, and such action is requested in due course. Should the Examiner feel a discussion would expedite the prosecution of this application, the Examiner is kindly invited to contact the undersigned.

Respectfully submitted,

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